Metastable, Mechanically Alloyed and Nanocrystalline Materials (Proceedings of ISMANAM-2001)

E. Ma, M. Atzmon, and C.C. Koch, Guest Editors
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For the past 10 years, interest has been growing rapidly in the use of miniature grinding mills as a means for modifying the constitution and structure of powdered materials (usually metallic) and, in particular, for creating various kinds of metastable or nanocrystalline materials. For several years now, frequent international symposia on this theme have been held at various places around the world: the logo is ISMANAM, the first two letters signifying "International Symposium," and the last five denoting the title of the book reviewed here. These proceedings have also appeared, separately, in *two* journals, the *Materials Science Forum* and the *Journal of Metastable and Nanocrystalline Materials*; this must constitute a new record for multisite publication of the same material!

The usual apparatus used in the work described in the 65 articles included here is a vibratory mill incorporating hard grinding balls (usually steel) and a small amount of the powder to be processed. One of the current interests is in controlling the severity of the grinding process by modifying the vibration variables, and this features in a few of the papers in this collection, one of which is titled "The Influence of Milling Intensity on Mechanical Alloying." Many of the articles are concerned with the formation of amorphous alloys, often starting from a mixture of the constituent crystalline elements—a combination of "mechanical alloying" and "amorphization." Before an intermetallic alloy formed by mechanical alloying can become amorphous, it first has to be disordered, that is, long-range atomic order must be destroyed. One of the articles treats the reordering process after this stage of the milling process. Also, a number of articles are described as "mechanochemistry," for example, the mechanochemical reduction of copper sulfide. The most extraordinary article in this group is devoted to the de-vulcanization of powdered scrap tire rubber, and as far as I could see, there is not a word about the economics of the proposed process! Finally, two groups of articles are mainly devoted to the synthesis, characterization, and stability of nanocrystalline materials.

The research in the broad field of interest of ISMANAM has one notable feature: Quite a few of the papers come from places around the globe that do not often contribute to materials science. The advantages of such research based on miniature mills are that the equipment is inexpensive and the characterization that needs to be associated with the milling can use simple x-ray diffraction, magnetic measurements, and other not-necessarily-expensive techniques, as well as transmission electron microscopy, scanning electron microscopy, and Mössbauer spectrometry, which are not so universally available. One might say that this field of research contributes to the "democratization" of research in materials science. Scientifically, much of this work is fascinating; whether anything of engineering significance will eventually emerge is another question.

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The following recently published books, relevant to materials science, have come to *MRS Bulletin's* attention. Some of the books listed here may be reviewed in future issues of *MRS Bulletin*.

Books

Electrochemistry of Silicon and Its Oxide, X.G. Zhang, Kluwer Academic Publishers, New York, 2001, 522 pp., $115.00, ISBN 0-306-46541-8.

Encyclopedia of Materials, Parts, and Finishes, M. Schwartz, CRC Press, Boca Raton, 2002, 925 pp., $229.95, ISBN 1-56676-661-3.

From Semiconductors to Proteins: Beyond the Average Structure, S.J.L. Billinge and M.F. Thorpe, eds., Kluwer Academic/Plenum Publishers, New York, 2002, 294 pp., $140.00, ISBN 0-306-47239-2.

Functional Group Chemistry, J.R. Hanson, Wiley Interscience, Bristol, 2002, 163 pp., $34.95, ISBN 0-471-22480-4.

Handbook of Cellular Metals: Production, Processing, and Applications, H.-P. Degischer and B. Kriszt, Wiley-VCH Verlag, Weinheim, 2002, 373 pp., $115.00, ISBN 3-527-30339-1.

Handbook of Thermoplastic Polyesters, *Vol. 1–2,* S. Fakirov, Wiley-VCH Verlag, Weinheim, 2002, 1377 pp., $370.00, ISBN 3-527-30113-5.

High Performance Structures and Composites, C.A. Brebbia and W.P. de Wilde, WIT Press, Southampton, 2002, 672 pp., $338.00, ISBN 1-85312-904-6.

High Reliability Magnetic Devices: Design and Fabrication, Colonel Wm. T. McLyman, Marcel Dekker, New York, 2002, 400 pp., $150.00, ISBN 0-8247-0818-0.

Intermetallic Compounds, Principles, and Practice. *Vol. 3:* Progress, J.H. Westbrook and R.L. Fleischer, John Wiley and Sons, West Sussex, 2002, 1036 pp., $485.00, ISBN 0-471-49315-5.

Liquid Metal Processing, I.G. Brodova, P.S. Popel, and G.I. Eskin, Taylor and Francis, London, 2002, 269 pp., $120.00, ISBN 0-415-27233-5.

Main Group Chemistry, W. Henderson, Wiley Interscience, Bristol, 2002, 196 pp., $34.95, ISBN 0-471-22478-2.

Microscopy of Semiconducting Materials 2001, A.G. Cullis and J.L. Hutchison, eds., Institute of Physics Publishing, London, 2001, 610 pp., $175.00, 0 ISBN -7503-0818-4.

Modern Aspects of Electrochemistry 33, R.E. White, J.O'M. Bockris, and B.E. Conway, Kluwer Academic Publishers, New York, 2002, 660 pp., $265, ISBN 0-306-45968-X.

Modern Aspects of Electrochemistry 34, Ralph E. White, J.O'M. Bockris, and B.E. Conway, Kluwer Academic Publishers, New York, 2001, 200 pp., $140.00, ISBN 0-306-46462-4.

Modern Electrochemistry 2A; *2d Ed.,* **Fundamentals of Electrodics**, J.O'M. Bockris, Kluwer Academic Publishers, New York, 2001, 788 pp., $95.00, ISBN 0-306-46166-8.

Modern Electrochemistry 2B; *2d Ed.,* **Electrodics in Chemistry, Engineering, Biology and Environmental Science,** J.O'M. Bockris and A.K.N. Reddy, Kluwer Academic Publishers, New York, 2001, 542 pp., $95.00, ISBN 0-306-46324-5.

Nanostructured Materials, H. Hofmann, Z. Rahman, and U. Schubert, eds., Springer Wien New York, New York, 2002, 193 pp., $129.00, ISBN 3-211-83779-5.

Nonadiabatic Transition: Concepts, Basic Theories, and Applications, H. Nakamura, World Scientific Publishing Co., Inc., Singapore, 2002, 376 pp., $72.00, ISBN 981-02-4719-2.

The Physics and Chemistry of Materials, J.I. Gersten, John Wiley and Sons, New York, 2001, 826 pp., $110.00, ISBN 0-471-05794-0.

Silicon Processing for the VLSI Era. *Vol. 4:* **Deep Submicron Process Technology,** S. Wolf, Lattice Press, Sunset Beach, 2002, 822 pp., $199.95, ISBN 0-9616721-7-X.

Spontaneous Ordering in Semiconducting Alloys, A. Mascarenhas, Kluwer Academic/Plenum Publishers, New York, 2002, 474 pp., $125.00, ISBN 0-306-46778-X.

Surfactants and Polymers in Drug Delivery, M. Malmsten, Marcel Dekker, New York, 2002, 368 pp., $165.00, ISBN 0-8247-0804-0. □

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